around the boundary being mowed. On some parts of the boundary, *D. spatulata* and *D. burmanii* grow, and I have noticed that after I mow, the tentacles of these plants bend over the small particles of dirt and grass that land on the leaves..

It would appear from this reaction, that the plants gain some nutrient from this debris that lands on them during the mowing process. After rain or when new leaves grow, the plants return to their usual appearance until the next time I mow when the same reaction again takes place.

The last species of CP to be found here on our block is a tuberous species, which is either an undescribed species or a close relative of *D. peltata*. This species in unusual in that it grows in the late summer and fall, with the coming of the rain, and it flowers quite early in the year. Most tuberous Drosera are winter growers, so this one is quite different in it's growing season.

The appearance of this species is very similar to *D. peltata*, with several differences. For one thing, it seldom forms a basal rosette, except for seedlings and smaller plants. The colour of the plants is usually a bronze colour, with plants tending to reddish or greenish depending on growing conditions. The plants can be short and upright, or long and straggling, the latter form being more common in long grass. The petals are white, and the sepals are smooth with a hairy margin. The ovary is a reddish brown colour. The plants we have here are very similar to those described as *D. peltata* "white petal/orange ovary" by Robert Gibson in the Australian CP journal of Vol 12 no. 4, December 1993, pp 15,16. However, the plants here have larger petals than these shown in Robert's drawing on page 15.

Carnivorous Plants of the Esperance Region, Western Australia

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The following is an account of the twenty-seven carnivorous plant species found during a five day expedition to the Esperance region of southern Western Australia in late October, 1992. The expedition was organized by Robert Gassin of Melbourne, who was accompanied by Sean Spence, Brian Denton, Fred Howell and myself. Sean, Robert and I drove from Melbourne to Adelaide where Brian and Fred joined us on the long drive to Esperance. We spent 4 days at Cape Le Grand National Park and also visited the adjacent Cape Arid National Park. We then camped at Fitzgerald River National Park for one night before investigating the surrounding area and commenced our trip home, armed with observations of abundant carnivorous plants in their natural environment.

A range of different environments supporting carnivorous plants was encountered during this expedition. In the Cape Le Grand area, wooded granite or laterite hills and margins rose above wooded to heath-covered coastal plains. The latter are studded with swamps and freshwater lakes, in which carnivorous plants abounded. To the east, in the Cape Arid area, drier coastal heath and woodland occurred, with fewer granite hills and wetlands, supporting fewer carnivorous plant species. In the woodland and heathland of the Fitzgerald River N.P. a surprisingly low number of carnivorous plant species were found, although this included 3 *Drosera* species not found elsewhere. Overall the area explored contains few streams of significant size, but the coastal area contains a surprising number of freshwater lakes and swamps. During the preceding months prior to our visit, the region had received an unusually high rainfall.

The twenty Drosera and seven Utricularia species found during the expedition are outlined below, with details of their habitats.

Drosera ericksoniae

Drosera ericksoniae was found in only one location, in the northern end of Fitzgerald River National Park growing in damp, sandy soil 3 to 6 metres from a small

creek in open woodland. Nonflowering, or fruiting, rosettes up to 2 cm diameter, were initially thought to be a robust form of *D. nitidula* ssp *nitidula*. This pygmy Drosera has not previously been recorded in the literature for this area.

Drosera glanduligera

Golden green rosettes of *D. glanduligera*, to 4 cm diameter, were found in all three National Parks and adjacent areas and grew in a number of different environments. In the Cape Le Grand area this winter-growing annual was found on the slopes of rounded granite hills, especially in thin wet soil on bare granite slopes. It was also found in creek beds, on the sandy flanks of granite hills and in disturbed areas of flat, damp sandy coastal heath. In Cape Arid N.P. this species was infrequently found in low coastal heath adjacent to a sizable wooded swamp as well as in the wetter parts of roadside drainage ditches. In Fitzgerald River N.P. it was found in wet sandy soil adjacent to creeks, in open heath, under low woody shrubs, beside the road and scattered in mallee woodland north of the park. The plants were in a range of growth stages according to the availability of water. Nonflowering, flowering and fruiting plants with live rosettes occurred in wet areas, whereas fruiting plants with dying or dead rosettes occurred on dry thin soils, particularly on granite hills. Plants produced up to 5 glandular scapes, each with up to 10 orange flowers, however, open flowers were only seen at two locations. A slightly different form of this species was found in a small area north east of Cape Le Grand N.P. which had distinctly pale orange flowers.

Drosera grievei

The first carnivorous plant we encountered in Western Australia was a pygmy Drosera which grew in a colony in a dry sandy depression amongst scattered, low-growing herbs, in a woodland clearing, approximately 150 km north of Esperance. The red-rosettes grew up to 1.5 cm diameter and had circular red lamina on green petioles which widened distinctly toward their base. The plants formed stems, to 1 cm tall, and a few of the larger individuals had hairless multi-flowered scapes to 4 cm tall, with up to 15, or so, white-petalled flowers.

In the field these plants were tentatively identified as *D. paleacea* ssp. *paleacea*, but they occurred a significant distance east of their published range (Lowrie, 1989). On closer inspection of the photographs taken at the time, it is more likely they are the recently described species, *D. grievei* (Lowrie and Marchant, 1992).

Drosera huegelii

Drosera huegelii was infrequently found in all three national parks, often in localized clusters of a few plants. In all cases the plants were found in dry-surfaced sandy, or stony soil, amongst low woody plants, or small trees, typically away from swamps or creek beds. This erect, tuberous species, to 30 cm tall, was instantly recognizable by its bell-shaped cauline leaves. Only plants seen in the Fitzgerald River N.P. still had bedewed glandular, orange-brown leaves and only one or two plants were found with seed capsules. In other areas the leaves had just begun to senesce.

Drosera leucoblasta

Drosera leucoblasta was found in Cape Arid N.P. and also in a disturbed area of dry woodland about 100 km north of Esperance. In both locations this pygmy Drosera grew in dry-surfaced sandy, or stony, soil in open areas between woody plants or in greater abundance in cleared areas, such as roadside gutters. The golden green rosettes grew to 2 cm diameter, with a prominent silvery stipule crown and supported up to 3 scapes. These grew to 10 cm tall each supporting up to 8 flowers. The 1 cm diameter flowers were open only in the morning and had vibrant orange petals.

Drosera lowriei

Rosettes of *D. lowriei*, to 3 cm diameter, were found only in a small valley in Fitzgerald River N.P. Many rosettes were still bedewed and a vibrant red colour, although some in drier soil had begun to die down. The plants occurred in abundance in saturated coarse sandy soil adjacent to the creek, with many rosettes under a thin film of clear water. Several rosettes had one to three ripe seed capsules full of spherical seed. This tuberous species had not been reported in this area before and was a

surprising discovery.

Drosera macrantha ssp. macrantha

Drosera macrantha ssp. *macrantha* was found in all three national parks, and in dry woodland west of Esperance. It was particularly abundant on the granite slopes in Cape Le Grand N.P. where it grew in damp thin soil around granite exposures and also the surrounding woodland, often away from other Drosera species. This climbing tuberous Drosera was easily identifiable by its leaves, in groups of three and retentive glands on the upper part of its stem. Plants grew up to 1.6 m long and were orange in colour. Many plants were setting fruit and had white-petalled flowers, but no open flowers were found. The remains of dormant plants were found on granite hills and air dry woodland in the other two National Parks where it was uncommon.

Drosera menziesii ssp. menziesii

This erect or scrambling tuberous Drosera was found primarily in Cape Le Grand and Cape Arid National Parks and the area in between. It grew in abundance around bare granite hill slopes and in coastal heathland. The red stemmed plants, many of which were in flower at the time of our visit, grew 10 to 40 cm tall. The sweetly-scented pink-petalled flowers are up to 2 cm diameter but only open in the morning to early afternoon on sunny days. Mass flowering can occur, which makes locating plants very easy, even from a moving car. Juvenile plants produced a red rosette, to 1 cm diameter and often lacked an erect stem. In coastal heath this species was found in damp, peaty sand, often around the edge of lakes, or in small depressions. The majority of plants were still in active growth.

Drosera modesta

Only one plant of the tuberous, climbing, *Drosera modesta* was found on the expedition. This nonflowering plant grew in woodland in a shallow valley in the Fitzgerald River N.P. I did not see this plant but Sean and Robert and reported it was 20 cm tall, with alternately arranged cauline leaves, and had just started to die down. It grew in a sheltered position near plants of *D. prostratoscaposa*.

Drosera neesii ssp. neesii

Drosera neesii ssp. *neesii* was found growing only in and around Cape Le Grand N. P. in damp to swampy areas of coastal heath. This golden-green tuberous Drosera produced erect stems to 30 cm tall, with shield-shaped cauline leaves. The plants in this area have pink-petalled flowers and ovaries which lack glandular hairs, whereas those around Albany, 350 km to the west, have pale-yellow flowers and are thus more typical of the plants of this species illustrated by Lowrie (1987). In the past these two forms have been classified as different species, *D. neesii* and *D. sulphurea* respectively (Erickson, 1968). The sweetly scented pale-pink flowers, up to 2 cm diameter, were open from morning to mid-afternoon. It was often found with *D. menziesii* ssp. *menziesii* around lake margins, extending into soils apparently too damp for the latter species. Its requirement for permanently damp soil appears to limit the range of this species.

Drosera nitidula ssp. nitidula

Drosera nitidula ssp. *nitidula* was only found in two locations in and near Cape Le Grand N.P. This locally common pygmy Drosera grew in discontinuous bands in moist sandy soil 1 to 4m from the edge of small lakes, amongst herbs and low woody plants. Many plants had multi-flowered-scapes, but the white-petalled flowers only opened in sunny conditions.

Drosera microphylla

Drosera microphylla was only found on the granite slopes of Mt. Le Grand, in Cape Le Grand N.P, where runoff was concentrated. Here this tuberous species occurred abundantly, and its erect, red stems and leaves turned patches of the granite slopes red. Its stems grew to 30 cm tall, surmounting a basal rosette to 2 cm diameter. Many plants were showing signs of commencing dormancy and only a few were flowering. Flowers open in the early morning and are usually white. One plant, however, had pale-pink petals with a darker pink base. In general, this species grew apart from all

other carnivorous plants species, with the exception of a few *D. menziesii* ssp. *menziesii* plants which shared some patches of thin moss-covered soil. A few plants also occurred on the down-slope edge of a large rock and sand lens on the granite slopes with *D. pulchella.*

Drosera occidentalis ssp. australis

Drosera occidentalis ssp. *australis* was the smallest, most numerous and widespread species of pygmy Drosera found in the expedition. It occurred in all three National Parks, and adjacent areas, but was generally limited to places where water was available for at least its growing season. It was found in creek beds of ephemeral streams on the flanks of granite hills, often amongst woodland, on top of rock and sand lenses on hill slopes and abundantly in the wetter parts of coastal heaths, swamps and lake margins. The red rosettes were up to 1 cm in diameter and supported several single-flowered scapes 2 to 3 cm tall. The white-flowers only opened for a short time on sunny days. In some situations the rosettes grew in shallow water, or in the shade of a dense cover of sedge and scattered shrubs in swamps, but were more often found in open, partially shaded conditions, in moist soil in roadside gutters or coastal heath.

Drosera paleacea ssp. trichocaulis

Drosera paleacea ssp. *trichocaulis* was found in coastal heath and woodland north of Cape Le Grand N.P, in coastal heathland in Cape Arid N.P., and recently burnt woodland in the Fitzgerald River N.P. This pygmy Drosera resembled *D. grievei* in many aspects but had an unmistakably hairy scape. The locally common plants grew in moist, but well-drained, sandy soil, generally several metres away from and higher than, the nearest lake or swamp. The white flowers opened on sunny days, often opening en masse.

Drosera prostratoscaposa

Drosera prostratoscaposa was found at its type area in the Fitzgerald River N.P. Eight rosettes of this tuberous Drosera were found. These were up to 7 cm diameter and either still bedewed or starting to die down. They grew in dry-surfaced, coarse-grained sandy soil in a small wooded valley with several plants of *D. glanduligera* . There were no signs that any had flowered.

Drosera pulchella

Drosera pulchella was only found in a few, conspicuously wet sites, in and near Cape Le Grand N.P. The mostly green rosettes of this pygmy *Drosera* were up to 2.5 cm diameter. They were found in peaty sand in the wettest parts of creek banks and the lower slopes of rock and sand accumulation on the northern flanks of Mt. Le Grand, but were more abundant in lowland coastal swamps. In the latter, it occurred in either open heath, commonly under a few centimetres of clear water, or in the shade of sedges and scattered shrubs in coastal swamps. It was also locally common on the margins of freshwater lakes. Only in one area were plants found in scape, but the pink-petalled flowers were not open due to the cloudy conditions. This species often grew with *D. occidentalis* ssp. *australis*, and less commonly with *D. menziesii* ssp. *menziesii*, *D. neesii* ssp. *neesii*., *D. microphylla*, *U. menziesii, U. tenella*, *U. violacea* and *U. westonii*.

Drosera pycnoblasta

Drosera pycnoblasta was found in only one location, on the dry floor of a shallow valley in open woodland approximately 200 km west-north-west of Esperance. The pygmy Drosera rosettes grew up to 1.2 cm diameter, surmounted by a very prominent rounded silvery stipule bud. Mature plants had developed short stems, to 1 cm tall and supported up to 2 scapes. Each multiflowered scape, to 10 cm tall, bore sweetly-scented white-petalled flowers to 8 mm diameter. The flowers were notable in that they lacked the red basal spot on the petals and had five styles, not three, thus differing from the plants illustrated by Lowrie (1989).

Drosera sargentii

This newly described taxa covers the *D. parvula*-like pygmy Drosera population of the Esperance district (Lowrie and Marchant, 1992) (Lowrie, 1989, p 134).

Nonflowering rosettes of this species were found in dry-surfaced, sandy soil in open low coastal woodland and heathland. They were up to 2 cm diameter, with red, rounded leaves and a relatively tall, and prominent silvery stipule bud.

Drosera scorpioides

Drosera scorpioides was found in Cape Le Grand N.P. and two areas of dry woodland north and west of Esperance. This distinctive, large pygmy Drosera has golden green leaves to 2.5 cm long held in an open rosette, often on a thin stem up to 10 cm tall. Plants may develop additional growing points on this stem and one notable plant had eight of these. A few plants had open, white petalled flowers, however, most mature plants had finished flowering at the time of our visit. This species grew only in conspicuously dry-surfaced sandy or pebbly soil, often several metres above and away from the closest water or damp soil. It often grew with *D. sargentii*, *D. huegelii*, *D. macrantha* ssp. *macrantha* and, rarely, *D. menziesii* ssp. *menziesii*. The plants grew in relatively open conditions, amongst scattered herbs and rare low woody plants.

Drosera zonaria

Drosera zonaria was found in open woodland or coastal heathland in all three National Parks and at one site west of Esperance. The rosettes of this tuberous Drosera grew in scattered clusters, typically in the shade of shrubs. It occurred in moist to dry-surfaced well-drained sandy soil, generally away from lakes or creeks. The green or yellow-red rosettes were up to 5 cm diameter and either still bedewed, or in varying stages of dying down. No rosettes had the remains of finished scapes. There were few insect remains on the bedewed plants, possibly due to the paucity of insects or the trapping inefficiency of the leaves.

Utricularia australis

Sparingly branched stems, to 15 cm long, of the aquatic *U. australis* were found only in two permanent lakes, both just north of Cape Le Grand N.P. They had bifurcated, much divided leaves bearing green bladders to 3 mm long and the typically bushy, non-curled growing point of this species. No plants were in bud, flower or fruit. This species grew amongst reeds and *Melaleuca* trees which emerged above the lakes surface. *Utricularia volubilis* also grew in one of the lakes, which had *U. tenella*, *D. pulchella* and *D. occidentalis* ssp. *australis* around its margin.

Utricularia benthamii

Utricularia benthamii was found only in and around Cape Le Grand N.P. in swampy areas of coastal heath and flooded swamps. Each plant had up to two single-flowered scapes to 15 cm tall, which rose above a cluster of filiform leaves, to 2 cm long, and 2 mm long traps on short green stolons. The solitary flower had a small white, two-lobed upper lip above a larger, incipient three-lobed lower lip which was lilac in colour save for an orange-yellow palate edged in dark purple. This annual was found in deeper ponds in a few drainage ditches and the swampy margin of a lake in coastal heath, where it grew with *U. violacea* and *D. occidentalis* ssp. *australis*. However it was most prolific in a permanent swamp covered with water to 10 cm deep and grew amongst *Melaleuca* shrubs less than 1 m tall. In the last setting it grew with *U. westonii* with *U. violacea*, *U. tenella*, *D. nitidula* ssp. *nitidula*, *D. menziesii* ssp. *menziesii* and *D. neesii* ssp. *neesii* on the swamp margin. The majority of flowers had produced seed.

Utricularia menziesii

Utricularia menziesii was found in and around Cape Le Grand N.P. where it grew both on the slopes of granite hills and in wet areas of coastal heath. On the flanks of Mt. Le Grand this perennial grew in thin saturated sandy soil around large bare granite areas or more rarely in sandy soil in a creek bed, in association with *D. glanduligera*, *D. menziesii* ssp. *menziesii*, *U. tenella* and rarely *D. occidentalis* ssp. *australis* and *D. microphylla*. In the low elevation coastal heath this species grew around numerous lakes in water up to 10 cm deep and up to 2 m from, and 20 cm above, the lake edge. It also grew in less abundance in moist soil in coastal heath, often with *U. tenella*, *D. neesii* ssp. *neesii*, *D. occidentalis* ssp. *australis* and *D. pulchella*. Although

the single-flowered scapes produced by many of the plants had died, the cluster of red, rarely green, leaves and traps was still alive and stood out from the peaty soil. Given the abundance around the granite outcrops and lakes, these plants must put on a stunning show throughout winter when they are in flower.

Utricularia tenella

Utricularia tenella was found in all three national parks and the area around Cape Le Grand N.P. and was the most widespread Utricularia seen on the expedition. This may be attributed to its ability to survive in drier environments than the other Utricularia species. In Cape Le Grand N.P it was found in thin wet soil around the edge of the bare granite flanks of Mt. Le Grand as well as lake margins and roadside drainage ditches in the coastal heathland. In many of the latter situations the soil surface was distinctly dry but the plants were still in flower and fruit. It was found in a similar environment in Cape Arid N.P. where it commonly grew with *D. glanduligera*, *D. menziesii* spp. *menziesii* and *D. occidentalis* ssp. *australis*. In Fitzgerald River N.P. robust white-flowered plants and the typical pink flowered plants grew in moist soil in a small valley, in the company of *D. glanduligera* and *D. lowriei*. The flowers of this annual have a distinctly three-lobed lower lip and up to three were supported on the one or two scapes which rise up to 15 cm from the neat cluster of leaves and traps. The majority of flowers were pollinated and this species produced an abundance of small, spherical seeds at the end spring.

Utricularia violacea

Utricularia violacea was found only in wet coastal heath in and around, Cape Le Grand N.P. always in small numbers. This winter growing annual produces a single flowered scape to 10 cm tall above a small cluster of traps and leaves. The small flower has a purple, notched upper lip and a larger purple lower lip with dark purple edged low white and yellow palate ridges. The majority of flowers of this winter-growing annual were pollinated. This species grew on the edge of lakes and flooded swamps, beside ponds in roadside gutters, in some moist creek banks and moist depressions where it was found in the company of various combinations of *U. tenella*, *U. westonii*, *U. menziesii*, *D. pulchella* and *D. occidentalis* ssp. *australis*.

Utricularia volubilis

Utricularia volubilis is a robust, mostly-submerged perennial species which was found only in two permanent lakes in and around Cape Le Grand N.P. It grew in water 10 to 70 cm deep, on the bed of which it has a loose cluster of green or red filiform leaves to 20 cm long, each terminated in a green or black bladder to 3 mm long. A single scape grew from the centre of each plant and grew erect until it neared the waters surface. From here it began to spiral vigorously anti clockwise and twined up adjacent emergent sedge leaves and other *U. volubilis* scapes. Each scape terminated in two, three or four large purple flowers which were born dichotomously or singularly. The flowers have a small, erect white upper lip and a large purple lower lip to 2.5 cm wide, the central palate ridges of which are yellow, edged darker purple in colour. At the time of our visit the plants were at the peak of flowering and had only just started to set fruit.

Utricularia westonii

Utricularia westonii was found only in and around, Cape Le Grand N.P. However, it was locally common in lake margins and edges, beside ponds in roadside gutters and in damp depressions in the coastal heathland. It grew in water up to 20 cm deep, as well as moist sandy soil. Up to three scapes were produced above the neat, typically red cluster of leaves and large (5 mm long) traps. Scapes of this species grew to 30 cm tall and had up to five pale pink flowers. The majority of spent flowers of this annual had been pollinated and ripe seed was beginning to be shed at the time of our visit. This species was commonly found with *U. violacea*, *U. benthamii*, *U. tenella*, *D. occidentalis* ssp. *australis* and *D. pulchella*.

The area covered in this expedition had the potential of yielding even more carnivorous plant species - *D. erythrorhiza* ssp *erythrorhiza*, *D. ramellosa D subhirtella* ssp. *subhirtella*, *D. subhirtella* ssp. *moorei*, *D. platypoda*, *D stolonifera* ssp. *compacta*,

U. dichotoma and *U. helix* were known to occur there (Lowrie 1987, 1989; Taylor, 1989) but were not found. However the 27 species we observed in the wild was an amazing experience which made the expedition unforgettable. It was also interesting to note the environment in which each species was found, which should assist in the cultivation of these amazing plants.

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CATTLE AS SARRACENIA STEWARDS?

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Behold the cow. From an anthropocentric view it stands there with a rather placid and bored facial expression as it nibbles forage or chews cud. Its weighty and ponderous body is balanced on four relatively small hooves that thus bear tremendous weight on each hoof that is transferred to the ground as it lumbers about the pasture, seemingly crushing all beneath those hooves. Appearing to eat everything green in sight, large quantities of nitrogenous waste products are passed very frequently. Due to its fermentative digestion, we are told that each cow passes significant quantities of methane that contributes to the greenhouse effect.

Not something you would want in your sarracenia patch, you say? Well, think again, maybe.

Stewards care for things. In terms of sarracenia bogs and savannas that are preserved by various conservation agencies, public or private, stewards are appointed either as volunteers or employees to provide security, and to actively work on the land to prevent any further deterioration that may have begun, or perhaps to reverse a decline. Those of you who have read my comments on this regularly have seen me praise the conserving agencies generously, but frequently criticize resulting stewardship which may very well be out of the original conserving agency's hands. Whether stewards are volunteers or are paid, once a responsibility is undertaken we all expect some knowledgeable activity because each preserve has its point below which it may well never recover to even the level at the time of conservation.

Let us look at two plots of land. One is privately owned and the owner wishes to do anything he can to get rid of the sarracenias on his land. The other piece of property has not been so attacked, in fact it has been under "management" for several years to preserve sarracenias, has just recently been purchased by a highly respected conservation group, and yet it is declining at an alarming rate in spite of all this love.

Our first piece of land is located in Toombs County, Georgia near the town of Lyons and in the famous Vidalia onion country. It is on a small family farm located on an obscure sideroad that parallels that historic north-south artery, US 1. The owner has an economically wise mixed approach to his farm with various crops and some beef cattle.

As one approaches his cow pasture on the road, the sight pictured in Figure 1